CLAIMS

I claim:

1. A method of starting a two-stroke engine comprising:

(A) manually driving a rotational component of the engine to rotate;

(B) determining an absolute rotational position of the component;

(C) enabling an engine firing sequence upon determining the absolute rotational position of the component; then

(D) determining a rotational direction of the component based on continued monitoring of the rotation of the component; and then

(E) disabling the engine firing sequence if is determined in step (D) that the component is running in a reverse direction.

2. The method as in claim 1, wherein the step of determining the absolute rotational position of the component comprises detecting rotation of first and second angularly-spaced indexing markers on the component past a detector and identifying the second detected indexing marker.

3. The method as in claim 2, wherein the step of determining the rotational direction of the engine comprises detecting rotation of a third indexing marker on the component past the detector and identifying the third indexing marker.

Subd

4. The method as in claim 3, wherein the determining step comprises determining a sequence that the identified indexing markers are detected.

5. The method as in claim 4, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the step of determining the sequence that the identified indexing markers are detected comprises counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

6. The method as in claim 2, wherein the markers are magnetic markers, and wherein the detecting step comprises detecting rotation of the magnetic markers past a magnetic pick-up device located adjacent the component.

7. The method as in claim 1, wherein the enabling step comprises enabling the supply of energizing current to at least one of an electronic fuel injection system of the engine and an electronic ignition system of the engine.

8. The method as in claim 1, wherein the engine is a battery-less engine which generates electricity to run the engine from rotation thereof, and further comprising beginning to generate electrical power immediately upon manually driving

the component to rotate, and wherein the engine rotates at least one revolution after initiation of the manually driving step before generating enough power to run the engine.

9. The method as in claim 8, wherein the manually driving step drives the engine to rotate through no more than five revolutions.

10. The method as in claim 9, wherein the manually driving step drives the engine to rotate through no more than three revolutions.

11. The method as in claim 8, wherein the engine is a snowmobile engine.

12. The method as in claim 1, wherein the manually driving step comprises manually pulling a rope-start mechanism.

13. The method as in claim 1, wherein the rotational component is a flywheel of the engine.

14. The method as in claim 1, wherein the engine is a snowmobile engine.

SUB A2

15. A method of starting a two-stroke battery-less engine, comprising:

(A) driving a rotational component of the engine to rotate by manually actuating a rope-start mechanism, the component comprising one of a crankshaft and a flywheel;

(B) detecting rotation of the component through first and second rotational positions thereof;

(C) determining, based on the detecting step, an absolute rotational position of the component, the determining step occurring before the component rotates more than 270°; then

(D) enabling an engine firing sequence immediately upon determining the absolute rotational position of the engine, the enabling step comprising enabling the supply of energizing current to at least one of an electronic injection system of the engine and an electronic ignition system of the engine; then

(E) detecting rotation of the component through a third position which is angularly spaced unequally from the first position and from the second position; then

(F) determining, based on the step (E), whether the component is rotating in a forward direction or a reverse direction; and

(F) disabling the engine firing sequence if it is determined in step (F) that the engine is running in the reverse direction.

16. The method as in claim 15, wherein the detecting steps comprise detecting rotation of first, second, and third indexing markers on the component past a detector located adjacent the component and identifying at least the second and third indexing markers.

17. The method as in claim 16, wherein the determining step (D) comprises determining a sequence that the identified markers are detected.

18. The method as in claim 17, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the step of determining the sequence that the identified markers are detected comprises counting the number of additional markers between the first and second indexing markers and the second and third indexing markers.

19. The method as in claim 15, wherein the engine rotates at least one revolution after initiation of the driving step before generating enough power to run the engine.

20. The method as in claim 19, wherein the driving step drives the engine to rotate through no more than three revolutions.

21. A two-stroke engine comprising:

(A) a manually-powered starter which, when actuated, drives a rotational component of the engine to rotate;

(B) a monitor which monitors rotation of the rotational component;

(C) an electrically powered device which, when energized, affects at least one aspect of an engine firing operation; and

(C) a computer which is coupled to the monitor and to the powered device and which is operable, in conjunction with the monitor and the powered device, to:

(1) determine an absolute rotational position of the component,

(2) enable a supply of energizing current to the powered device upon determining the absolute rotational position of the component,

(3) determine, based on continued monitoring of the rotation of the component after the absolute rotational position of the component has been determined, whether the component is rotating in a forward direction or a reverse direction, and

(4) disable the supply of energizing current to the powered device if it is determined that the component is running in the reverse direction.

22. The engine as in claim 21, wherein the component has first and second angularly-spaced indexing markers thereon, wherein the monitor includes a detector which is configured to detect movement of the first and second indexing markers therepast, and wherein the computer is configured to identify the second detected indexing marker.

23. The engine as in claim 22, wherein the component has a third indexing marker thereon which is angularly spaced from the first indexing marker and the second indexing marker, wherein the detector is configured to detect movement of the first and second indexing markers therepast, and wherein the computer is configured to identify the third detected indexing marker.

24. The engine as in claim 23, wherein the computer is configured to determine a sequence that the identified indexing markers are detected.

Sub D1

25. The engine as in claim 24, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, and wherein the computer is configured to determine the sequence that the identified indexing markers are detected by counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

26. The engine as in claim 22, wherein the markers are magnetic markers, and wherein the detector comprises a magnetic pick-up device located adjacent the component.

27. The engine as in claim 21, wherein the powered device comprises at least one of an electronic injection system and an electronic ignition system.

28. The engine as in claim 27, wherein the engine is a battery-less engine which generates electricity to run the engine from rotation thereof.

29. The engine as in claim 28, wherein the manually actuated starter is capable of driving the engine to rotate through no more than five revolutions.

30. The engine as in claim 21, wherein the engine is a snowmobile engine.

31. The engine as in claim 21, wherein the manually actuated starter comprises a rope-start mechanism.

32. The engine as in claim 21, wherein the rotational component is a flywheel of the engine.

33. A snowmobile incorporating the engine of claim 21.

34. A two-stroke engine comprising:

(A) means, responsive to a manually-input force, for driving a rotational component of the engine to rotate;

(B) means for determining an absolute rotational position of the component;

(C) means for enabling an engine firing sequence upon determining the absolute rotational position of the component;

(D) means for determining a rotational direction of the component based on continued monitoring of the rotation of the component after the absolute rotational position of the component is determined; and

(E) means for disabling the engine firing sequence if the means for determining the rotational direction of the component determines that that the component is running in a reverse direction.

35. The engine as in claim 34, wherein the means (A) comprises a rope-start mechanism.

subD'

36. The engine as in claim 34, wherein the means (B) through (E) include a computer.

37. The engine as in claim 34, wherein the means (B) comprises means for detecting rotation of first and second indexing markers on the component past a designated position and determining an angular spacing between the first and second markers.

38. The engine as in claim 37, wherein the means (D) includes means for detecting rotation of a third indexing marker on the component past the designated position and determining a sequence that the identified indexing markers are detected.

39. The engine as in claim 38, wherein the second indexing marker is located at a first angular spacing α from the first indexing marker and a second angular spacing β from the third indexing marker, wherein α is not equal to β, wherein a plurality of equally-spaced indicator markers are provided on the component, and wherein the means (D) comprises means for counting the number of indicator markers between the first and second indexing markers and the second and third indexing markers.

Add a5